PATENT SPECIFICATION
DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

# An Improved Nut Fastener for Use with Sandwich-type Panels

I, FREDERICK WILLIAM ROHE, of 879, South East Street, Anaheim, California, United States of America, a citizen of the United States of America, do hereby declare the invention for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a nut fastener for use with light-weight sandwich-type panels such as are used in the interior wall and floor construction of airplane fuselages. Such fasteners include an insert held in position in the panel by a surrounding body of solidified anchoring material, such for example as epoxy resin, moulded into a cavity in the panel around the insert so as to anchor the insert within the panel with one end of the insert exposed in an opening in one side of the panel, and permit of attachment to the panel of a bracket or other member by means of a bolt or screw passing through the bracket and threaded into the insert.

The invention provides a nut fastener for use with sandwich type panels, comprising a shell adapted to be anchored in a cavity in the panel by a surrounding body of solidified anchoring material and including a tubular barrel and inner ad outer heads, the outer head having a central opening to receive a fastener bolt and the inner head being closed and formed with at least one radially extending recess communicating with the base of the barrel, and a floating nut having an internally threaded sleeve portion accommodated within the barrel of the shell and a projecting lug accommodated within each recess in the inner head of the shell, the sleeve having radial clearance in the barrel so that the nut may float in relation to the shell and the shell coacting with the lug or lugs to limit rotation of the nut in relation to the shell. Preferably the outer head of the shell is circular and the inner head is non-circular.

One embodiment of fastener according to the invention will now be described in detail, by way of example, with reference to the accompanying drawing in which:—

Fig. 1 is an exploded perspective view of the component parts of the fastener.

Fig. 2 is a plan view of a lightweight sandwich panel with the fastener inserted therein; and

Fig. 3 is a section taken on the line 3—3 in Fig. 2.

In the drawing, a lightweight honeycomb core type of sandwich panel is indicated generally at A, the fastener is indicated generally at B, and an anchoring body of solidified synthetic resin C anchoring the fastener in a cavity in the panel is indicated at C.

The panel A comprises a pair of skin sheets 10 and 11 secured, as by cementing, brazing or welding to the edges of a low density core 12 of honeycomb cellular construction. To receive the fastener B, the panel A is provided with a hole 13 which is formed through the skin sheet 11 and through a cellular core 12, stopping at the inner face of the opposite skin sheet 10. As will be seen in Figs. 2 and 3, the hole 13 includes a circular opening in the skin sheet 11 and is bounded by the projections 14 of the cell forming walls, of the core 12. Between the projections 14 the hole 13 includes lateral recesses 15 (Fig. 2).

The body of synthetic resin utilized to fill the hole 13 has a series of lateral wings 16 projecting into the recesses 15 and a central annular body 17 which encircles and adheres to the fastener B, which is thus securely locked to the panel A. Preferably the body C also includes a thin flat pad 18 adhering to the inner surface of the skin sheet 10 and to the end of the fastener B to provide maximum area of bonding connection between the fastener and the panel.

The fastener comprises a shell, indicated generally at 19, and a floating nut, indicated generally at 20. The nut 20 has a cylindrical sleeve portion 21 having an internally threaded

bore 22 and a pair of diametrically opposed radially projecting lugs 23 situated adjacent the closed bottom of the hole 13.

The shell 19 consists of a cylindrical tubular barrel 24 formed with an integral circular outer head 25 and an integral inner head 26 which is partly circular but is of greater thickness than the head 25 and has flats 27 on diametrically opposite sides thereof. The inner head 26 is closed by a thin flat circular closure disc 28 secured, as by brazing or welding, to the end face 29 (Fig. 1) of the head 26.

In the head 25 is a central opening 30 through which a fastener bolt can be inserted and threaded into the nut 20. Within the barrel 24 of the shell 20 is a counterbore 31 which loosely receives the internally threaded sleeve 21 of the nut 20, with substantial radial clearance to accommodate radial self-aligning shifting of the nut 20. Within the inner head 26 are a pair of diametrically opposed radial recesses 32 which receive the lugs 23 on the nut 20 with axial, radial and circumferential clearance so as to provide for full self-aligning movements of the nut 20 when engaged by the bolt, and so as to permit the outer end of the nut to be drawn into seating engagement with a shoulder 33 defined at the bottom of the counterbore 31.

The counterbore 31, its outer end shoulder 33, the recesses 32 and the end disc 28, cooperate to define a socket which is closed except for the bolt insertion opening 30 in the head 25. The nut 20 is caged in this socket.

To install the fastener, a body of synthetic resin is injected into the hole 13 in the panel A in a liquid or semi-liquid form. A catalyst or curing agent, for causing the body of liquid resin to solidify into a hard, rigid anchor body, is mixed with the resin prior to insertion. The fastener B is then pushed into the soft body of resin through the open end of the hole 13, extruding the resin up around the sides of the shell 19. The quantity of resin inserted into the hole 13 is such that the body of resin will rise approximately into contact with the inner surface of the skin sheet 11 when the end free of the head 25 has been brought to a position flush with the outer surface of the sheet 11. In this position, the closure disc 28 will be slightly spaced from the opposite skin sheet 10 so as to leave the thin pad 18 of resin interposed between the closure disc and the sheet 100.

The engagement of the harded resin body against the outer face of the inner head 26, and against the inner face of skin sheet 11 will effectively secure the fastener against being pulled out of the hole 13 when tension is applied to the nut 20 by a bolt tightly screwed thereinto, if the part being fastened to the panel does not seat against the outer end face of flange 25. When such seating does occur, the end load developed by tightening the bolt in the nut 20 will be taken directly by the head 25 interposed between the part and the end of the sleeve 21. The engagement of the body C of resin against the flat faces 27 of the inner head 26, and the keyed engagement of the radially projecting portions 16 of the body C in the recesses 15, will effectively resist rotation of the shell 19. The shell 19 in turn will restrain the nut 20 against rotation through the keyed engagement of the lugs 23 in the recesses 32.

WHAT I CLAIM IS:—

1. A nut fastener for use with sandwich-type panels, comprising a shell adapted to be anchored in a cavity in the panel by a surrounding body of solidified anchoring material and including a tubular barrel and inner and outer heads, the outer head having a central opening to receive a fastener bolt and the inner head being closed and formed with at least one radially extending recess communicating with the bore of the barrel, and a floating nut having an internally threaded sleeve portion accommodated within the barrel of the shell, the sleeve having radial clearance in the within each recess in the inner head of the shell, the sleeve having radial clearance in the barrel so that the nut may float in relation to the shell and the shell coacting with the lug or lugs to limit rotation of the nut in relation to the shell.

2. A fastener according to Claim 1, wherein the outer head of the shell is circular and the inner head is non-circular.

3. A fastener according to Claim 2, wherein the inner head of the shell is partly circular and provided with opposed flats.

4. A fastener according to any preceding claim, wherein the inner head of the shell is formed with two diametrically opposite recesses accommodating diametrically opposite lugs on the nut.

5. A fastener according to any preceding claim wherein the inner head of the shell is closed by a thin closure disc fixed to its end face.

6. In combination a sandwich-type panel having a cylindrical cavity extending through one of its skin sheets, a fastener as claimed in Claim 1 fitted into the cavity with the end face of the outer head of the shell flush with the outer face of said skin sheet and its inner head adjacent the other skin sheet and a body of solidified anchoring material surrounding the shell of the fastener and locking it in position in the panel so that the shell cannot rotate in the panel or be withdrawn therefrom.

7. The combination claimed in Claim 6, wherein the body of enclosing material includes a thin pad between the inner head of the shell and the adjacent skin sheet.

8. A fastener as claimed in Claim 1 substantially as described herein with reference to Fig. 1 of the accompanying drawing.

9. The combination with a sandwich-type panel of a nut fastener substantially as described herein with reference to Figs. 2 and 3 of the accompanying drawing.

BREWER & SON,
Chartered Patent Agents,
5—9, Quality Court, Chancery Lane,
London, W.C.2.

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876,106 COMPLETE SPECIFICATION
1 SHEET
This drawing is a reproduction of the Original on a reduced scale.

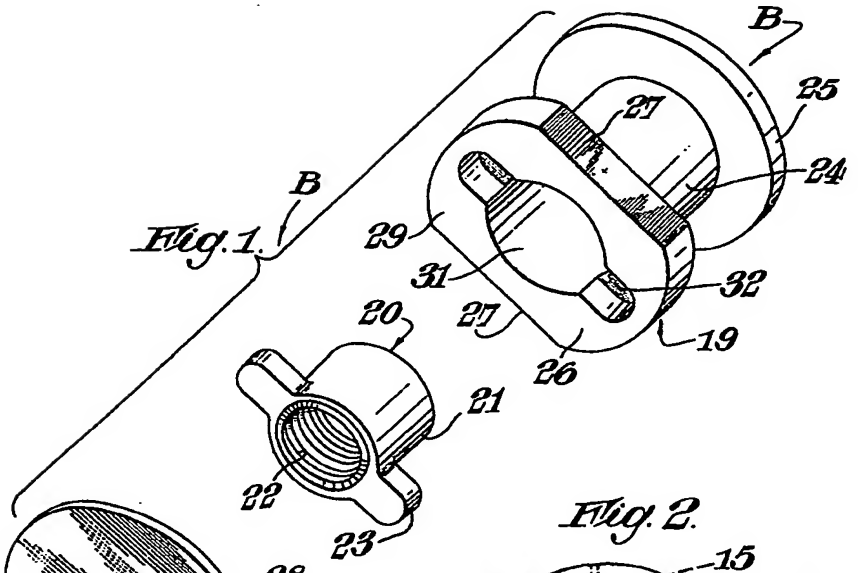


Fig. 1.

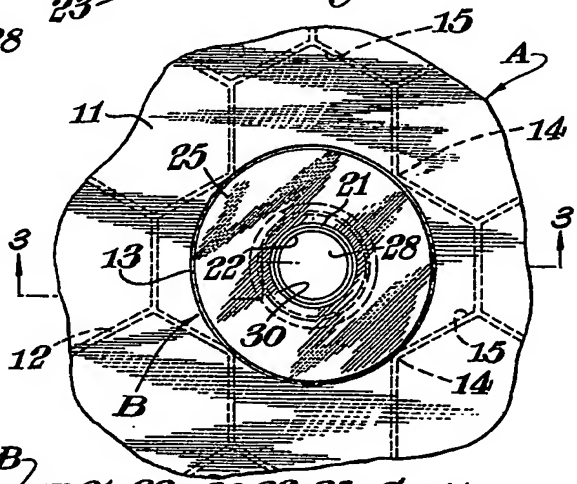


Fig. 2.

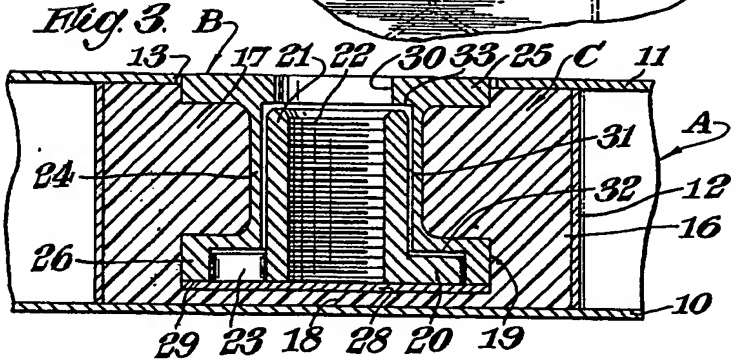


Fig. 3.